CLAIMS

1. An unsupervised segmentation method for assigning multi-dimensional data points of a selected data set amongst a plurality of classes, the method comprising the steps of:

(a) defining an initial class encompassing all data points of the selected data set;

(b) defining a second class by selecting a data point and assigning it to the second class together with data points within a first predetermined neighbourhood of the selected data point;

(c) testing each data point lying within a second predetermined neighbourhood of data points in the second class by calculating the probability that each said data point belongs to the first class and the probability that it belongs to the second class, and assigning it to the second class if the probability that it belongs to the second class is higher; and

(d) said probability calculations being adapted during said method in dependence upon the assignment of the points to the classes.

2. A method according to claim 1 wherein the probability calculations comprise the steps of determining a probability distribution of a property of the data points in the initial class and determining a probability distribution of said property of the data points in the second class and comparing the data point under test with said probability distributions.

3. A method according to claim 1 or 2 wherein said calculation is adapted by recalculating said probability distributions as data points are assigned to classes.

4. A method according to claim 3 wherein said probability distributions are recalculated on the basis of the number of data points in each class.

5. A method according to claim 4 wherein said probability distributions are recalculated after each assignment of a data point.

6. A method according to claim 2, 3, 4 or 5 wherein the probability distributions are calculated on the basis of histograms of the data points.

7. A method according to claim 6 wherein the histograms have bins of unequal width.

8. A method according to claim 7 wherein the widths of the bins of the histograms are set to give an initially approximately equal number of counts in each bin.

9. A method according to any one of the preceding claims wherein steps (b), (c) and (d) are repeated iteratively testing in step (c) data points lying within the second predetermined neighbourhood of data points assigned to the second class.

10. A method according to claim 9 wherein steps (b) to (d) are repeated iteratively until no more data points are added to the second class.

11. A method according to any one of the preceding claims further comprising the step of defining a third class by selecting a data point from the initial class and assigning it to the third class together with data points within the first predetermined neighbourhood of the selected data point, and repeating the method iteratively with respect to the third class.

12. A method according to any one of the preceding claims further comprising the step of discarding any class which fails to have sufficient data points assigned to it in step (c) according to a predetermined criterion, by reassigning its data points to the initial class, when all data points within said predetermined neighbourhood have been tested.

13. A method according to claim 12 further comprising the step of concluding the segmentation when all classes formed in turn on the basis of selecting each of the data points remaining in the initial class have been discarded.

14. A method according to any one of the preceding claims wherein said first and second predetermined neighbourhoods are open spheres centred on the data point and having a predetermined radius.

15. A method according to any one of the preceding claims wherein said first and second predetermined neighbourhoods are defined on a parameter space containing the data points.

16. A method according to any one of the preceding claims wherein said data points are derived from an image, said classes corresponding to different physical parts in said image.

17. A method according to claim 16 wherein said property of said data points comprises a descriptor of at least part of an object in the image and the spatial coordinates of that part.

18. A method according to claim 17 wherein the descriptor comprises at least a value representing the shape of at least part of said object.

19. A method according to claim 18 wherein the descriptor comprises at least a value representing the size of at least part of said object.

20. A method according to any one of claims 16 to 19 wherein the image is a medical image.

21. A method according to any one of claims 16 to 19 wherein the image is a

volumetric image or non-invasive image.

22. A method according to any one of claims 17 to 21 wherein the data points are taken from a spatial model fitted to said image.

23. A method of demarcating different parts of a structure in a representation of the structure, comprising the steps of calculating for each of a plurality of data points in the representation at least one shape descriptor of the structure at that point, and segmenting the representation on the basis of said at least one shape descriptor.

24. A method according to claim 23 wherein the descriptor comprises at least one value representing the cross-sectional size of the structure at that point.

25. A method according to claim 24 wherein the at least one value representing the cross-sectional size comprises the lateral dimensions of the structure at that point.

26. A method according to claim 24 wherein the at least one value comprises a measure of the mean radius of rotation of the structure as said point.

27. A method according to claim 23, 24 or 26 wherein the at least one value is calculated by defining a volume at said point and changing the size of the volume until a predefined proportion of the volume is filled by the structure.

28. A method according to claim 27 wherein the volume is a spherical volume.

29. A method according to any one of claims 23 to 28 wherein the representation is segmented automatically.

30. A method according to claim 29 wherein the representation is segmented using an unsupervised segmentation method.

31. A method according to any one of claims 23 to 28 wherein the representation is segmented by hand.

32. A method according to any one of claims 23 to 31 wherein the structure is in the human or animal body.

33. A method according to any one of claims 23 to 31 wherein the representation is a medical image.

34. A method according to any one of claims 23 to 31 wherein the image is a volumetric or non-invasive image.

35. A method according to any one of claims 23 to 34 wherein the representation is a model of the structure.

36. A method according to any one of claims 23 to 35 wherein the segmentation method is in accordance with any one of claims 1 to 22.

37. A computer program comprising program code means for executing on a programmed computer the method of any one of the preceding claims.

38. Apparatus for segmenting a data set of multi-dimensioned data points, the apparatus comprising:

means for receiving the data set;

a data processor for segmenting the data set in accordance with the method of any one of claims 1 to 23; and

a display device for displaying the segmented data set.

39. Apparatus according to claim 38 wherein the means for receiving the data set comprises an acquisition device for acquiring the data set from a subject.

40. Apparatus for demarcating different parts of a structure in a representation of the structure, the apparatus comprising:

means for receiving said representation in the form of a data set;

a data processor for processing said data set to demarcate the different parts of the structure in accordance with the method of any one of claims 23 to 31.